

What is claimed is:

1. A liquid crystal projector, comprising:

a light source;

an optical element for changing the light from said light  
5 source into a parallel light, to be divided into three (3) light  
beams;

three (3) kinds of liquid crystal panels for transmitting  
the three (3) light beams divided by said optical element  
therethrough, so as to modulate intensity thereof;

10 an optical synthesizing means for synthesizing the three  
(3) light beams, passing through said three (3) kinds of liquid  
crystal panels, to be modulate intensity thereof;

a projection means for projecting the three (3) light beams,  
which are synthesized by said optical synthesizing means; and

15 a liquid cooling cycle, including a pump and a radiator  
therein, for circulating a liquid coolant within said three (3)  
kinds of liquid crystal panels, so as to conduct cooling thereof,  
wherein

each of said three (3) kinds of liquid crystal panels defines  
20 a flow channel for the liquid coolant between a surface of said  
liquid crystal panel and a transparent member to be disposed  
opposing thereto, respectively, and further, said flow channel  
includes a high-resistance flow channel being flat and uniform  
in thickness thereof, covering a liquid crystal panel area of said  
25 liquid crystal panel, and also a buffer portion formed neighboring  
to a one of upstream side and downstream side of said high-resistance  
flow channel.

2. A liquid crystal projector, comprising:

a light source;

an optical element for changing the light from said light source into a parallel light, to be divided into three (3) light beams;

5        three (3) kinds of liquid crystal panels for transmitting the three (3) light beams divided by said optical element therethrough, so as to modulate intensity thereof;

an optical synthesizing means for synthesizing the three (3) light beams, passing through said three (3) kinds of liquid  
10 crystal panels, to be modulate intensity thereof;

a projection means for projecting the three (3) light beams, which are synthesized by said optical synthesizing means; and

a liquid cooling cycle, including a pump and a radiator therein, for circulating a liquid coolant within said three (3)  
15 kinds of liquid crystal panels, so as to conduct cooling thereof, wherein

each of said three (3) kinds of liquid crystal panels defines a flow channel for the liquid coolant with a surface of said liquid crystal panel and a transparent member to be disposed opposing  
20 thereto, respectively, and further, said flow channel includes a high-resistance flow channel being flat and uniform in thickness thereof, covering a liquid crystal panel area of said liquid crystal panel, and also an auxiliary flow channel lower in flow resistance than said high-resistance flow channel, being formed surrounding  
25 said high-resistance flow channel.

3. A liquid crystal panel for use in a liquid crystal projector, comprising:

two (2) pieces of transparent substrates, enclosing a liquid crystal between them; and further

30        at least a transparent plate, being disposed opposing to

one surface of said two (2) pieces of transparent substrates, so as to form a flow channel for a liquid coolant between them, wherein

said flow channel defines a high-resistance flow channel being flat and uniform in thickness thereof, and further comprises  
5 a buffer portion neighboring to a one of upstream side and downstream side of said high-resistance flow channel.

4. A liquid crystal panel for use in a liquid crystal projector, comprising:

two (2) pieces of transparent substrates, enclosing a liquid  
10 crystal between them; and further

at least a transparent plate, being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to form a flow channel for a liquid coolant between them, wherein

said flow channel defines a high-resistance flow channel  
15 being flat and uniform in thickness thereof, and further comprises an auxiliary flow channel lower in flow resistance than said high-resistance flow channel, being formed surrounding said high-resistance flow channel.

5. A liquid cooling apparatus for cooling liquid crystal  
20 panels for use in a liquid crystal projector, each panel having two (2) pieces of transparent substrates, enclosing a liquid crystal between them, with a liquid coolant, comprising:

at least a transparent plate, being disposed opposing to one surface of said two (2) pieces of transparent substrates, so  
25 as to define therebetween a high-resistance flow channel being flat and uniform in thickness thereof, covering a liquid crystal panel area of said liquid crystal panel, and also a buffer portion neighboring to said flow channel; further

a driving means for the liquid coolant, connected to said  
30 buffer portion of said liquid crystal panel; and

a heat radiator means for radiating heat of said liquid crystal panel, which is received in said flow channel into an outside, whereby building a liquid cooling cycle.

5 6. A liquid cooling apparatus for cooling liquid crystal panels for use in a liquid crystal projector, each panel having two (2) pieces of transparent substrates, enclosing a liquid crystal between them, with a liquid coolant, comprising:

10 at least a transparent plate, being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to define therebetween a high-resistance flow channel being flat and uniform in thickness thereof, covering a liquid crystal panel area of said liquid crystal panel, and also an auxiliary flow channel lower in flow resistance than said high-resistance flow channel, being formed surrounding said flow channel; further

15 a driving means for the liquid coolant, connected to said buffer portion of said liquid crystal panel; and

a heat radiator means for radiating heat of said liquid crystal panel, which is received in said flow channel into an outside, whereby building a liquid cooling cycle.

20 7. A liquid crystal projector, comprising:

a light source;

an optical element for changing the light from said light source into a parallel light, to be divided into three (3) light beams;

25 three (3) kinds of liquid crystal panels for transmitting the three (3) light beams divided by said optical element therethrough, so as to modulate intensity thereof;

30 an optical synthesizing means for synthesizing the three (3) light beams, passing through said three (3) kinds of liquid crystal panels, to be modulate intensity thereof;

a projection means for projecting the three (3) light beams, which are synthesized by said optical synthesizing means; and

a liquid cooling cycle, including a pump and a radiator therein, for circulating a liquid coolant within said three (3) kinds of liquid crystal panels, so as to conduct cooling thereof, wherein

each of said three (3) kinds of liquid crystal panels defines a flow channel for the liquid coolant between a surface of said liquid crystal panel and a transparent member to be disposed opposing thereto, respectively, and further, said flow channel includes a first flow channel being flat and uniform in thickness thereof, covering a liquid crystal panel area of said liquid crystal panel, and also a second flow channel provided on a one of upstream side and downstream side of said first flow channel, having flow resistance higher than that in said first flow channel.

8. The liquid crystal projector, as described in the claim 7, wherein said liquid crystal panel further comprises a buffer portion neighboring to said second flow channel, in addition to said second flow channel.

9. A liquid crystal panel for use in a liquid crystal projector, comprising:

two (2) pieces of transparent substrates, enclosing a liquid crystal between them; and further

at least a transparent plate, being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to form a flow channel for a liquid coolant between them, wherein

said flow channel defines a first flow channel being flat and uniform in thickness thereof, within an area covering a liquid crystal area of said liquid crystal panel, and further comprises a second flow channel neighboring to a one of upstream side and downstream side of said high-resistance flow channel, having flow

resistance higher than that in said first flow channel.

10. The liquid crystal panel for use in a liquid crystal projector, as described in the claim 9, wherein said liquid crystal panel further comprises a buffer portion neighboring to said second flow channel, in addition to said second flow channel.

11. A liquid cooling apparatus for cooling liquid crystal panels for use in a liquid crystal projector, each panel having two (2) pieces of transparent substrates, enclosing a liquid crystal between them, with a liquid coolant, comprising:

at least a transparent plate, being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to define therebetween a first flow channel being flat and uniform in thickness thereof, covering a liquid crystal panel area of said liquid crystal panel, and also a second flow channel on a one of upstream side and downstream side of said first flow channel, being higher in flow resistance than that in said first flow channel; further

a driving means for the liquid coolant, connected to said first and said second flow channels of said liquid crystal panel; and

a heat radiator means for radiating heat of said liquid crystal panel, which is received in said first and said second flow channels into an outside, whereby building a liquid cooling cycle.

12. The liquid cooling apparatus for cooling liquid crystal panels for use in a liquid crystal projector, as described in the claim 11, wherein said liquid crystal panel further comprises a buffer portion neighboring to said second flow channel, in addition to said second flow channel.